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gave his evidence honorably, agreeably to the facts and scientific precedents. In this his example is worthy of imitation, and suggestive as to whether it would not be an improvement in the present practice if like men should be retained by the court rather than by the contestants.

In private life Mr. Francis was honest, sympathetic, neighborly, not hasty in forming or giving opinions, but always consistent and decided, liberal, a good citizen and Christian gentleman, contributing largely to the honor and welfare of the city, whose memory will be long and gratefully preserved by its inhabitants.

1893. W. E. WORTHEN.

## EBEN NORTON HORSFORD.

EBEN NORTON HORSFORD was born on July 27, 1818, at Moscow, Livingston County, New York. His father, Jerediah Horsford, sprung from an old New England stock, came from Charlotte, Vermont, and settled at Moscow as a missionary to the Seneca Indians. His mother, whose maiden name was Charity Maria Norton, came from Goshen, Connecticut, and traced her descent from Thomas Norton of Guildford and John Mason, the famous captain in the Pequot war. She was a woman of strong intellectual tastes, and remarkable for her public spirit, shown by the fact that, after reading her books, she made of them a sort of free circulating library for the benefit of her neighbors in what was then a wild and primitive region.

Amid such surroundings at home it was not strange that the boy grew up with strong scholarly tastes, and was known to his playmates as a marvel of general information. It is interesting to note that a favorite amusement was collecting the fossils which abounded on his father's farm, as this recreation of his boyhood undoubtedly turned his thoughts toward the natural sciences, to which so large a part of his manhood was devoted, while at the same time his early association with the Seneca Indians, who flocked to his father's house in large numbers, familiarized him with Indian words and pronunciation, and thus paved the way for the philological and archæological studies of his older years.

In his education away from home, the most important influence was Mrs. Jared Wilson, the wife of the teacher of the Livingston County School, where he passed the years from thirteen to sixteen, his earlier education having taken place in the schools of the district.

Mrs. Wilson was a remarkable woman, and did much toward building up his character on the broad foundations laid by his mother.

From the Livingston County School he went to the Rensselaer Polytechnic Institute of Troy, New York, from which he graduated as a civil engineer in 1837. While studying at the Rensselaer Institute he spent his vacations in earning money toward his support, at first by teaching at Leroy, and later by work on the surveys for the New York and Erie, and the Rochester and Auburn Railroads.

After his graduation he obtained for a time congenial employment on the Geological Survey of the State of New York, under Professor James Hall, and in 1840 was appointed Professor of Mathematics and Natural Sciences in the Albany Female Academy, a position which he held for four years. During this time he took up the study of Daguerre's photographic process with Morse, the inventor of the telegraph, and this work attracted the attention of the scientific world to him, and led to his delivering a course of lectures on chemistry at Newark College in Delaware in 1843, and another in 1844, after he had left the Albany Academy. This period at Albany was of great importance in the formation of his character; Hall and Morse fostered his taste for scientific research and impressed upon him careful and accurate methods of work; the Reverend Dr. William Sprague had a strong influence on his general development; and at the Female Academy he met Mary L'Hommedieu Gardiner, who afterward (in 1847) became his wife.

So far as his future was concerned, the most important result of his growing reputation was an invitation from Professor Webster to visit him in Cambridge, when he urged Horsford to go abroad and study, — advice which was followed in December, 1844. Arrived in Germany he turned his steps toward Giessen, at that time the goal of all chemical students, where Liebig had recently introduced the modern method of teaching chemistry in the laboratory. Here he spent two happy profitable years in the society of such men as Hofmann (whose desk was next his), Williamson, Fresenius, Will, and many others who afterward became famous in the science, — a chemical family over which Liebig exercised a fatherly care. At the end of this time Liebig, with whom he was a great favorite, urged him to take the degree of Doctor of Philosophy. This he refused to do, because he was living on borrowed money, and thought it not right to involve himself further in debt, even by the slight amount of the fee for the degree. Liebig induced the University to offer to remit the fee, a great honor when the tenacity with which Universities cling to their fees is remembered; but Horsford, from honorable though exaggerated scruples, refused to accept this favor, and returned to America, without a degree it is true, but with his mind broadened by contact with such different surroundings and intercourse with men of the first intellectual ability, his chemical knowledge pushed even to organic chemistry, at that time the very frontier of the science, and bearing as proofs of his acquisitions a paper on glycocoll and a strong recommendation from Liebig. These at once caused his election, at the instance of Professor Webster, to the "Rumford Professorship of the Application of Science to the Useful Arts" in Harvard University, and his first duty in this position was to organize the laboratory of the newly founded Lawrence Scientific School after the plan of that at Giessen. He addressed himself to this task with the energy which was so large a part of his character; the laboratory opened most successfully, and flourished under his management for sixteen years, during which time many chemists of distinction were educated there. As a teacher he was remarkably clear and suggestive, and with his sanguine, enthusiastic temperament was always urging his students along the new lines of work which he had proposed to them.

Among the papers published by him at this period of his life only a few of the most striking can be mentioned. Such are an extended research on the action of mercury on various metals, a theoretical paper on the relation between the properties of the metals of the alkaline earths and their atomic weights, and, more important than these, some other discoveries, which are at the same time more characteristic of the man because they were undertaken to benefit mankind directly, rather than to throw light on the more abstruse portions of the science. One of these was a paper on the action of water on lead pipes, which contained some of the results of an exhaustive investigation into the best material for the water-pipes of Boston at the time of the introduction of Cochituate water. This work occupied him for many years, but, as he considered it a public service, he refused the very ample compensation offered him by the city of Boston, although at the time decidedly in need of money. The city accordingly presented him with a handsome service of plate. The other inventions of this class do not appear in the list of his scientific papers, but include his most valuable work. Such are his fundamental improvements in the art of making cider, at that time a large industry in New England, and the invention of condensed milk. The latter he worked out for use in Dr. Kane's Arctic Expedition, and afterward gave the process to one of his assistants named Hoffmann, who sold it to Borden, so that Horsford himself got no advantage from it; but his merit as the inventor of this most important preparation was recognized at the Vienna Exhibition of 1873 by a diploma of honor. Another of these important inventions was the phosphatic yeast-powder, the object of which was to return to the bread the phosphates lost in bolting the flour, and which, as is well known, form such an essential constituent of the food of animals. In 1856 he undertook the manufacture of this yeast-powder, founding the Rumford Chemical Works for this purpose, and after he had secured his rights by a lawsuit which dragged along during seven wearisome years, and overcome the great difficulties inseparable from the establishment of a new process on a commercial scale, he made it a great success, which was enhanced later by the use of the acid portion of the yeast-powder as a medicine and beverage under the name of acid phosphate. It is pleasant to see that this work, which was undertaken primarily for the good of mankind by improving the quality of our principal food, should have brought him such a substantial reward. The demands of this business, however, became so great, that, in 1863, he was obliged to resign the Rumford Professorship to devote himself entirely to its management. After his retirement from his professorship he continued to live in Cambridge until his death, as it had become endeared to him by his long residence and the brilliant society in which it then rejoiced.

In addition to the useful inventions already mentioned, several other pieces of public service date from the period of his professorship, especially during the war. He was devotedly patriotic, as was to be expected from the son of a woman whose house was one of the stations on the "Underground Railroad" for the escape of fugitive slaves, and rendered great service by contriving a plan for the defence of Boston Harbor, having been appointed on a commission for this purpose by Governor Andrew, and by devising a marvellously compact and light marching-ration of compressed beef and parched wheat grits, of which half a million were prepared by the government at the instance of General Grant. A description of this ration was published in pamphlet form.

In 1847 he married Mary L'Hommedieu Gardiner, who died in 1855; and in 1857 he married her sister, Phœbe Dayton Gardiner, who survives him. These ladies were the daughters of the Hon. Samuel Smith Gardiner, of Shelter Island, New York, and after his death Professor Horsford and his family came into exclusive possession of his very large estate there by the purchase of the interest of the other heirs. After this he usually spent his summers on Shelter Island, and these were the parts of the year which he enjoyed most; the scenery of the island is beautiful and restful, the climate delicious, and the old manor-house, with the estate, which has been in the family from the time of the Indians, full of most interesting associations. He soon became interested in studying the antiquities of the place and the family, and erected monuments to the Quakers who were sheltered here from Puritan persecution. Afterward these antiquarian studies took a broader field from a chance reference let fall by one of his guests to the legendary Norumbega, and furnished him with an engrossing and congenial occupation for the later years of his life. The results of his researches were published in a series of costly monographs, illustrated with heliotypes and reproductions of ancient maps, of which he accumulated an almost unrivalled collection.

The following are the most important of his discoveries in this field: the identification of Salem as the place of the landfall of John Cabot; the discovery of the fort of Norumbega on the Charles River, and of the city of the same name in Watertown, Massachusetts, including the finding of many curious remains; the Norsemen in America, and the identification of the site of the house of Leif Erikson in Cambridge by the determination of the approximate latitude, and the recognition of the topographic features described in the saga, confirmed later by the discovery of hearths and other portions of an ancient house; finally, the origin of the name America, which, as well as many other names in this country, he derived from Eric, the father of Leif. These conclusions of his met with much opposition, as was to be expected, but they brought him an invitation to take part in the scientific proceedings of the Society of Americanisti in Spain in commemoration of the discovery of America by Columbus, to which he responded by the paper on the name of America mentioned above, and also led to his creation by the King of Denmark a Knight Commander of the third grade of the Order of Dannebrog in October, 1892, an honor which has found few parallels in America. Among his services to archæological and philological science should not be forgotten his publication of the Dictionary of the Iroquois and Algonquin Languages, written by Zeisberger, and for many years preserved in manuscript in the Library of Harvard College.

In 1873 he revisited Europe as United States Commissioner to the Vienna Exhibition, where he occupied a commanding position on the jury for food products. He afterward published the results of some of his observations made at this time in an able pamphlet on Vienna Bread. One of the great pleasures of this visit to Europe consisted in renewing the old friendships formed in Giessen; but the best of these was not to be renewed, as Liebig, his chemical father, died while he was on his voyage from America. In 1880 he again crossed the ocean, this time to visit Norway, and again in 1890, when he took a course of the waters at Carlsbad. In the mean time he had not neglected the Western Hemisphere, as he made two journeys to California, in the second one visiting Mexico also, and in 1887 took a voyage to Demerara and the Windward Islands.

In 1876 he served as a juror at the Centennial Exhibition in Philadelphia, and he was twice, with an interval of thirty years between the appointments, an Examiner of the Mint. He was elected a Resident Fellow of our Academy on May 25, 1847.

He delivered numerous popular lectures, among others the first course at the Lowell Institute; and of his addresses should be especially mentioned that at the Morse Memorial in 1872, afterward published in pamphlet form, and the oration at the unveiling of the statue of Leif Erikson in Boston in 1887.

The wealth which came to him as a result of his ability in manufacturing chemistry was freely used in charity, both public and private. Of Wellesley College he was a frequent and liberal benefactor, showing in his gifts a wisdom which does not always distinguish those who give money to colleges. First among these should be placed his endowment of the library, providing for its administration, as well as more than doubling the number of books. Among these additions should be especially mentioned the valuable Powell collection on comparative philology. The Professors also are indebted to him for the establishment of a year of rest in every seven, and the foundation of a pension fund. Among his other gifts are a fund for scientific apparatus, an electric light plant, and an ozone apparatus for purifying the air of the halls, which has proved very successful in this, so far as I am aware, its first use on a large scale. These, however, form but a small part of what he gave the College, since he was continually on the watch to satisfy its needs as they arose, not only to add to its efficiency, but to promote the health and comfort of both professors and students; and quite as valuable as his gifts in money was the sympathetic interest with which, as President of the Board of Visitors from its foundation, he watched over the interests of the College, and fostered its growth.

This useful and happy life came to an end, January 1, 1893, when, after only little more than twelve hours of sickness, he died of heart disease.

His most prominent personal characteristic was a genial gayety, which, with his cordial, exuberant hospitality, was simply the overflowing of his large, warm heart; this endeared him to his hosts of friends, among whom were numbered many of the brilliant poets and scientific men who adorned Cambridge during the time of his service as Rumford Professor, and such others as Ole Bull, Ericsson, and Henry. It also manifested itself in the affectionate care with which he treated the operatives of the Rumford Chemical Works, more as if they were his children than his paid laborers. Nowhere were these beautiful traits in his character more delightfully manifested than in his beloved Sylvester Manor at Shelter Island, where he was in his element, dwelling on the familiar but ever fresh beauties of the scenery, showing his visitors the latest improvements, or delighting them with learned and interesting accounts of the antiquities of the island, or his own more extended archæological researches. In these researches he showed the singular ingenuity of mind, the dogged persistency in clinging to a problem until he had mastered its minutest details, the unconquerable enthusiasm, and the honesty of purpose which were his leading characteristics, and to which his great success in the worlds of science and business was due. In reviewing his life, his successes, great as they were, are not the most striking things. These are rather his extraordinary public spirit and his high sense of honor; and it is pleasant to realize that he achieved to a remarkable degree the main object in his career, both as a scientific man and as a citizen, — the help and improvement of his fellow creatures.

1893. CHARLES L. JACKSON.

## WILLIAM RAYMOND LEE.

COLONEL WILLIAM RAYMOND LEE, whose death on the 26th of December, 1891, attracted considerable attention at the time, belonged to the Marblehead or Revolutionary Lees. His grandfather, whose name he bore, was in the Revolutionary War the colonel of a Marblehead regiment. From him Colonel Lee derived his right to membership in the Cincinnati. Another ancestor, Jeremiah Lee, was prominent in many ways in the Revolutionary struggle.

William Raymond Lee was born in 1807. He was educated at West Point, where he was a member of the class of 1829. He